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Contribution from the Bureau of Plant Industry, Wm. A. Taylor, Chief.
February 19, 1915.

CRIMSON CLOVER: SEED PRODUCTION.¹

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INTRODUCTION.

One of the handicaps to the wider utilization of crimson clover is the fact that it is a winter annual and must be resown each year late in the summer. The purchase of the necessary seed on the local market has usually called for an outlay of money at a time when money, and even credit, is particularly scarce on the ordinary farm. The recent development of crimson-clover seed strippers to gather seed for resowing local areas makes practicable a much wider utilization of this crop than heretofore. A greater acreage of crimson clover will undoubtedly be sown when the seed is produced locally on each individual farm at a small outlay of time and money. Up to the present time the lack of a simple means of harvesting the seed for home use has greatly retarded the seed production and consequently the extension of this soil-improving crop. Fortunately for the grower of crimson clover on the ordinary farm, there have been developed recently two simple types of seed-gathering devices which will make it practicable for every farmer to let a portion of his crimson clover stand for seed, gather it in the hull, and immediately bag and house it for sowing later in the season. These devices are described and illustrated in the following pages. In addition, a brief discussion is given of the requirements necessary for successful seed production, as well as of the methods used for producing seed in commercial quantities for the market.²

¹ This bulletin is adapted primarily to the crimson-clover section, viz., the eastern portion of the United States south of Pennsylvania.

² The really remarkable soil improvement resulting from the growing of crimson clover in the Southern and Eastern States, where the winters are not too severe, makes it highly desirable that as large an area as possible be seeded to this or a similar leguminous crop. Its value as a soil improver and as a hay crop, the fact that it makes its growth during the fall and early spring, when the land is not occupied by the ordinary money crops, and its presence in a green condition during the winter, thus preventing erosion of the field, all combine to make it a very valuable asset to the farmer who would maintain the fertility of his farm. North of the cotton belt it is possible to produce a crop such as corn each season and at the same time make a seeding of crimson clover in the standing corn at the last cultivation, then plowing it under for the succeeding corn crop the following spring. In the cotton belt the clover may be seeded from October 1 to November 1. This enables one to produce a leguminous crop as well as one of the ordinary money crops on the land each season. In this connection, see Farmers' Bulletin 550 for directions as to the growing of the crop and also Farmers' Bulletin 579, concerning the utilization of the crimson-clover crop. These bulletins may be obtained free upon application to the Secretary of Agriculture.

SEED PRODUCTION FOR LOCAL USE.

If the crimson-clover seed is to be sown in the immediate neighborhood, it is practicable to sow the seed in the hull with greater prospects of a successful stand than when the cleaned and hulled seed purchased in the market is used. The fact that a bushel of seed in the hull, even when well packed down, ordinarily contains somewhat less than 2 pounds of cleaned seed makes it impracticable to transport the seed long distances, on account of its bulk.

There are a number of methods of gathering the seed for local use, the practicability of any particular one being ordinarily dependent upon the quantity of seed to be harvested on a given farm. Where the quantity to be gathered is limited and hand labor is cheap, the seed may be stripped by hand and bagged as gathered. This method, while tedious, is occasionally resorted to where there are no better means available. The ordinary cost of stripping seed in this way is 10 to 15 cents a bag of 5 bushels.

Another primitive method of saving the seed is by flailing. After the clover is bunched in the field, a canvas is laid alongside the shock and the seed is flailed out on this to avoid loss. This canvas is dragged from bunch to bunch as the flailing process continues. If barn or shed room is available, the mown plants can be placed under cover shortly after being cut and the seed flailed out later in the season without danger from rain.

The experience of a few individuals indicates that in Virginia and northward to southern Pennsylvania where it is desired to reseed an orchard to crimson clover, a strip of plants may be left standing along each row of trees. In midsummer the cross harrowing will scatter the seed from the unplowed strip and will usually result in a fair seeding. This method is not recommended for the Southern States and is only suggested for experimental trial northward.

HOMEMADE COMB STRIPPERS FOR HARVESTING CRIMSON-CLOVER SEED.

The devices here described can be made in almost any locality during the period of the year when work is slack. The necessary material can usually be obtained locally at a very small cost. Inasmuch as a device of this kind can be used for only about two weeks in the year, it is important that as little capital as possible be tied up in it, and for this reason the machine should be no larger than is necessary for the particular work in hand. It is possible for a single stripper to be utilized by a number of farmers, who may jointly own the device or who may make arrangements with the owner for its use. The clover heads, to strip well with any of these devices, should be thoroughly mature. The heads should also be quite dry, so that no serious heating will occur.

If the clever fields are on ground so stumpy or rough as to make a horse-hauled machine impractical, a hand clover-seed stripper can be readily constructed at a cost of a dollar or less for material and labor. (Fig. 1.) It will be noted that this device consists of a series of fingers or teeth about 10 inches long at the bottom of the box which is to hold the stripped seed. The handle and box are sufficiently heavy to enable the stripper to be swung through a mass of ripe clover plants with enough momentum to strip the seed from the heads without interrupting the swinging motion of the stripper. This device is especially recommended on rocky places or in corn-stubble ground, where a horse-drawn machine would have difficulty in working on account of the corn stubble and other obstacles present. The operation of this model is slow and ordinarily is not to be recommended.

For seedings of from 5 to 20 acres a stripper 3 to $3\frac{1}{2}$ feet wide but with longer teeth is suggested. This is not so wide but that it can be swung on the axle between the wheels taken from an old buggy, between the hind wheels of a carriage or buggy, or even attached to the rear



FIG. 1.—A hand-operated comb stripper which has been successfully used in Virginia.



FIG. 2.—A 3-foot comb stripper attached to an old pair of buggy wheels. This type has been used to a considerable extent in the vicinity of Chula, Va.

axle of a light farm wagon. (Figs. 2 and 3.) This comparatively narrow machine is recommended where the different fields upon which it is to be used are not connected by wide roads. It can be taken readily on its own wheels along any ordinary wagon road, although if stumps or other obstructions are likely to be en-

countered it is best to place the stripper box on top of the shafts and axle. If necessary, one man and a horse can operate the machine to good advantage, although a boy to drive the horse and assist



FIG. 3.—A 3-foot comb stripper hung on the rear axle of a buggy.

in bagging the seed and cleaning out the teeth when they become clogged will ordinarily be advisable. About 2 acres a day can be gathered by one of these machines. The seed so obtained will ordinarily be sufficient to seed 8 to 10 acres.



FIG. 4.—A 4 1/2-foot comb stripper attached to an old mowing machine.

It is also possible to attach a box of this width to the modified cutter bar of an old mowing machine. (Fig. 4.) In this case it is necessary to provide a device for raising and lowering the teeth without dismounting from the mower seat.

Where seed is desired for sowing 20 acres or more, the expense of a machine from 8 to 10 feet in width will ordinarily be justified,

especially if the ground be level and free from obstructions. The wide stripper box can be suspended from the axle of an old hayrake



FIG. 5.—Bagging the newly stripped seed from an 8-foot comb stripper at Chula, Va.

or be placed above a low axle of its own with substantial wheels, which may, if necessary, be made entirely of wood. (Figs. 5 and 6.)



FIG. 6.—An 8-foot comb stripper in operation. Note the cleanliness of the work done.

In transporting this machine from field to field it is ordinarily best to load it on a wagon or hayrack.

The teeth in all the above-described machines are similar. These teeth should be $1\frac{1}{2}$ inches wide, with the openings between them one-fourth inch wide at the top and three-fourths inch wide below. If

the openings between the teeth are somewhat wider at their bases, or toward the rear, than at the points, it will reduce their tendency to choke up and will also facilitate cleaning them out when they become clogged. The teeth should ordinarily be sawed from well-seasoned oak planks an inch or more in thickness. These planks may be of any available width, enough of them being laid side by side to bring the stripper up to the desired width. (Fig. 7.)

It is necessary to have the stripper balanced on its axle, so that it will swing easily. Some sort of a handle at the rear of the stripper

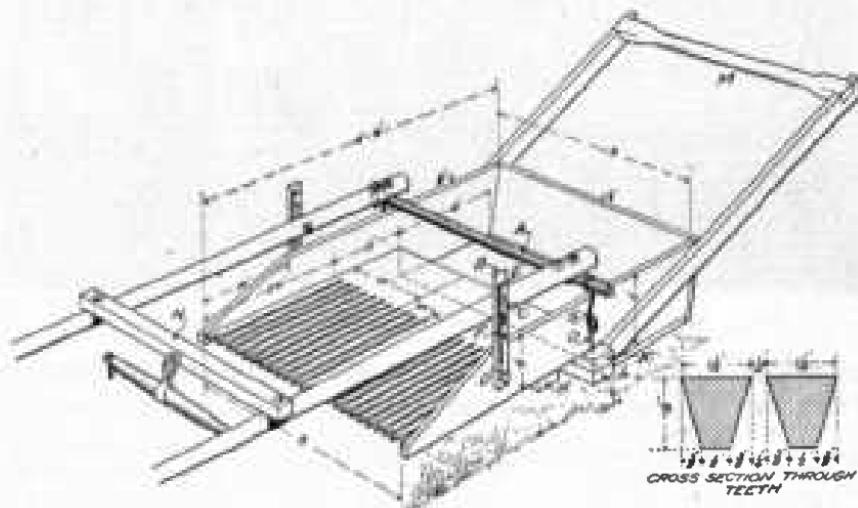


FIG. 7.—Working drawing of a crimson-clover seed stripper. This stripper is designed to be hung on the axle (A) between two wheels, which, however, are not shown in the drawing. The iron hooks (G) are used for attaching the stripper to the axle. The hooks (G) should be of such length as to keep the bottom of the stripper 6 inches above the surface of the ground. The handle (M) permits the teeth to be raised or lowered to catch the heads at the proper height. The limits to which the teeth may be raised or lowered are fixed by means of the slot (F). This prevents either the front or back of the machine tilting enough to strike the ground. When it is desired to hold the stripper rigid, the removable bolt (C) can be taken out and inserted in one of the holes (E). The bolt (D) should fit loosely in the bottom of board (B) to permit the easy action of the attachment. It is necessary to have the scantling (N) to which the whiffletree is attached fastened to the shafts far enough in front of the teeth to prevent the horse's hoofs from coming in contact with the teeth of the stripper. The teeth are sawed out of oak boards, which in turn are nailed to scantlings (H and K).

is necessary to enable the operator to vary the height of the teeth to accommodate them to the ever-changing height of the clover or to avoid any obstructions which might prove injurious to the machine. Most of the choking up of the teeth is due to weeds which will not slip through between the teeth. These comb strippers, while possessing the advantage of being very cheap and easily constructed, are open to the objection of choking up rather easily, especially if the fields are weedy. At the end of the seed-gathering season the stripper should be put under cover and the teeth securely fastened between two boards 6 inches wide, to prevent warping.

ROTARY-BRUSH STRIPPERS.

In order to avoid the choking up of the teeth, so characteristic of the comb strippers, attention has been given to the construction of a rotary-brush stripper. Mr. J. F. Barghausen, of the Office of Crop Technology, in cooperation with the writer, and with the assistance of Mr. E. Brown, Botanist in Charge of the Seed Laboratory, and Mr. J. E. Covert, of the Bureau of Crop Estimates, has developed a device of this sort. Successful preliminary tests with this attachment were made in Virginia in the late spring of 1914. This rotary-brush stripper consists of a rapidly rotating reel, or drum, supporting rows of brushes which strip the seed hulls from the heads while they

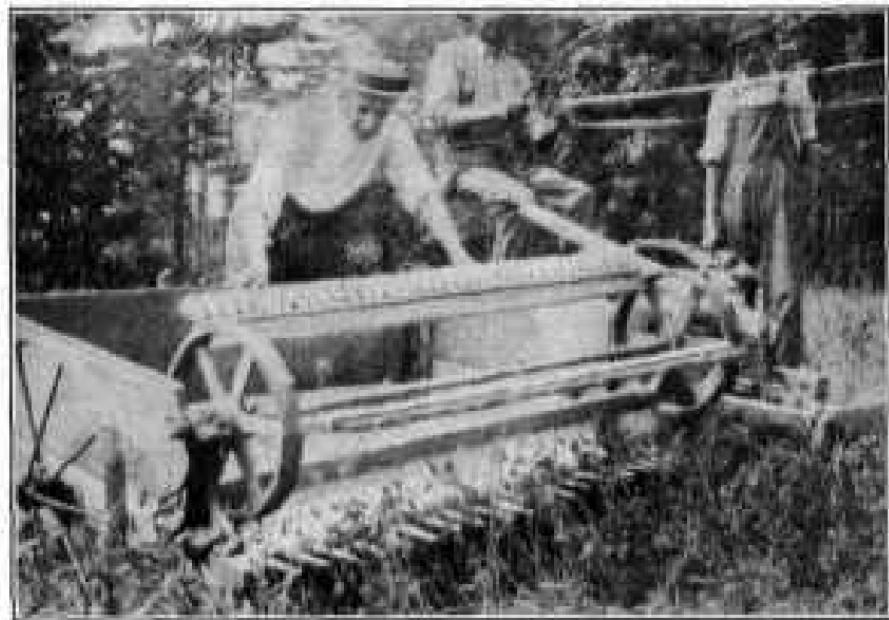


FIG. 8.—Detailed view of rotary-brush stripper during preliminary tests with various types of brushes.

are momentarily held at the back of the rather wide opening between the teeth of the stripper. The presence of the rotating brushes makes it possible to have the spaces between the teeth broad enough to prevent choking even with an occasional old corn stub or a comparatively large weed. The accompanying illustration (fig. 8) shows this device in operation when attached to a bluegrass stripper. While such a device must ordinarily be constructed by a machine company, it can be attached to any farm machine which will furnish the necessary rotary power for the brushes. The ordinary mowing machine appears to be best adapted to this purpose. Almost every farmer possesses a mower, and very slight modifications are necessary for such an attachment. It is expected that attachments of this kind

adapted to the ordinary makes of mowing machines will soon be on the market.

While the harvesting of seed in the hull is subject to a few handicaps, such as bulkiness and a tendency to stick together in small bunches when being seeded, yet there are not the serious disadvantages which are often present in the commercial seed-producing areas, where the crop is cut and left in the field until a huller can be obtained. As soon as the stripped seed is harvested it is put in bags, which are ordinarily stored in a tobacco barn or elsewhere under cover until seeding time. The bags should be watched, however, and if they show any signs of heating they should be emptied out on a covered floor, or at least under a shed, where the piles can be stirred occasionally. Before seeding time comes it is desirable that a sample of 100 hulls be counted out from different portions of the pile and these rubbed out in the palm of the hand. One-half the hulls should show good seeds. If they show more or less than this, due allowance should be made in the rate of seeding. From 75 to 90 good seeds per square foot should be sown to insure a satisfactory stand. A bushel of hulls well packed down will ordinarily make from $1\frac{1}{2}$ to 2 pounds of seed. From 10 to 12 bushels of well-packed seed in the hull are ordinarily sown per acre. Seed of crimson clover more than 2 years old is very apt to fail to produce a stand. Old seed is ordinarily of a brown color.

COMMERCIAL GROWING OF CRIMSON-CLOVER SEED.

The principal drawback in the harvesting of crimson-clover seed for commercial purposes is the tendency on the part of the plants to shatter their seeds almost as soon as they are ripe. For this reason it is necessary to cut the field a little before it has reached the proper stage for harvesting by strippers. It is also desirable that the plants be somewhat damp, as with dew, when cut, in order to retard this shattering of the seed. Any mechanical device or method of harvesting which will reduce the shattering while being harvested is to be strongly recommended. In some sections it is the practice to cut during the night, in order to avoid shattering the seed. In doing this it is necessary to hang a lantern on the end of the tongue of the mower or reaper. If a mowing machine only is available, it is sometimes the practice to attach a sheet or canvas to the cutter bar, the two rear corners of which are held up by a man walking behind. The cutter bar is set high enough to cut the stems just below the heads. The resulting piles of heads are placed under cover or hauled direct to the huller. The stands are usually cut for seed about a week or 10 days after the last blossoms have faded and when the last maturing seeds in the top of the head have reached the soft-dough stage. The

ordinary procedure in the seed-producing sections is to use a self-rake reaper (fig. 9), which deposits the newly cut stems with the heads all turned one way in small gavels at the side of the reaper, so that the

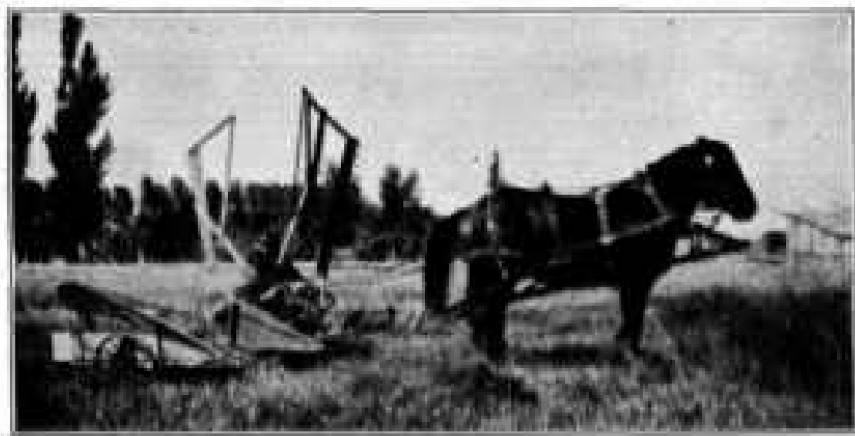


FIG. 9.—Self-rake reaper for dropping the newly cut plants in bunches.

horses do not trample them on the succeeding round. These gavels are sometimes placed two or three together in a small bunch to cure, but quite often they are left as dropped until the huller comes, when



FIG. 10.—Hauling crimson clover to the huller. When the plants are cut for seed, the self-rake reaper drops them in small bunches, which are often left to lie in the field until the huller comes.

they are loaded one at a time on tight-bottomed hayracks and hauled to the huller (figs. 10 and 11).

The seed is generally hulled with a special huller, which is equipped with two cylinders, one to shatter the hulls off the heads and the other to rub the hulls from the seed. The cleaners, which are

attached to the hullers, deliver the seed in a fairly good marketable condition, although it is usually the custom to run the seed through a small cleaning machine before it is put on the market. Figure 12 illustrates a machine which is adapted to the work of cleaning crimson-clover seed. The thrashed clover straw may be scattered



FIG. 11.—Hulling crimson-clover seed. About 8 acres is considered a good day's work. The yield varies from 3 to 11 bushels an acre.

back on the ground and turned under for soil-improving purposes or it may be used for bedding.

HOW TO GROW A GOOD CROP OF SEED.

It has been found that the first few seedlings of crimson clover on an ordinary field generally result in better crops of seed than do the seedlings after the clover has been grown upon a particular field for a considerable number of years. It is a well-known fact that too much nitrogen in the soil induces an overgrowth of stems and leaves, at the expense of the seed crop. This is probably what happens to the crimson-

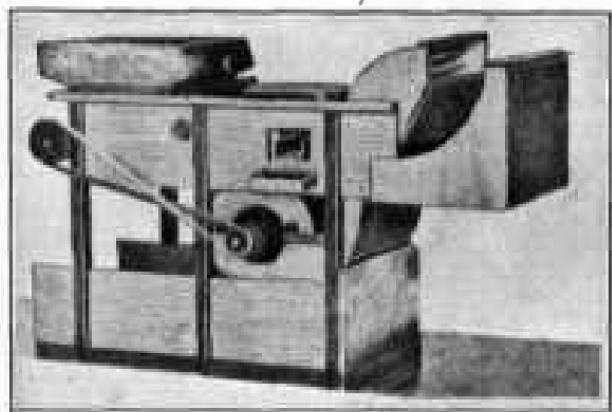


FIG. 12.—A type of fanning mill adapted to the recleaning of crimson-clover seed.

clover field when the stubble or entire crop is turned under during successive seasons, thus making the soil presumably somewhat too rich in nitrogen fertilizer for the best results in seed production. For this reason any of the richer and more fertile soils will also be found to have a tendency to produce stems and

leaves at the expense of the seed, even on fields where no crimson clover has recently been grown. This condition is desirable if hay or green manure is the main object, but if large seed crops are wished for, soils of medium fertility or those which have not grown crimson clover successfully for more than two or three years should be chosen for the prospective seed crop. On ground of comparatively low fertility the first or even second crop of crimson clover may not be able to make a growth vigorous enough to produce even a crop of seed. If the ground is rather infertile, it should receive potash and phosphoric acid in the form of commercial fertilizers. For a good seed crop the stand must not be too thick, but it should be thick enough to keep down the weeds. In view of the difficulty of separating weed seeds from crimson-clover seed, it is important that the field be free from weeds that mature their seed about the same time as crimson clover.

CRIMSON-CLOVER SEED COMPARED WITH HAY AS A MONEY CROP.

Yields of as many as 11 bushels of cleaned seed have been reported from the crimson-clover sections. Yields of 3, 5, and 7 bushels per acre, however, more nearly represent the average range of production.

The high price of hay throughout the crimson-clover section, combined with the somewhat unsatisfactory yields of commercial seed which have been secured lately, has resulted in a material reduction of the quantity of crimson clover left for seed in Delaware and Maryland, where most of the commercial seed grown in this country is produced. In former years, when 7, 8, or even 10 bushels were not uncommon yields, the raising of the seed was decidedly profitable, especially when hay was selling for only \$10 to \$15 a ton. During recent years, however, with the hay at \$20 to \$25 a ton and seed yields ranging from 3 to 5 bushels per acre, it has been considered more profitable to raise the crop for hay than to let the stand remain for seed. With 1½ and 2 tons of good hay as a practical certainty, it requires a yield of 5 to 6 bushels of seed per acre to represent an equal money value.

Much of the uncertainty of the crimson-clover seed crop lies in the frequent occurrence of a rainy spell after the crop is cut and before a huller can be secured to thresh the seed. An untimely rain will often materially injure the seed and sometimes cause it to germinate. When the seed can be stripped and bagged for local use, it can readily be housed and injury from rain thus avoided.

In order that commercial seed production may be carried on in a locality, it is necessary to have enough seed grown each season to warrant the presence of at least one huller in such a community. This condition of affairs is the case in most of Delaware and the southern half of the Eastern Shore of Maryland. In other sections,

especially in the States south of the Potomac River, the seed-producing areas in any one community are not ordinarily large enough at present to justify the purchase of a special huller on the part of any one of the residents of that particular locality. In such sections it is customary either to purchase the seed for sowing or to harvest a small portion of the seed in the hull for seeding the latter part of the same summer.

WEEDS TO BE AVOIDED IN A CRIMSON-CLOVER FIELD.

The most troublesome weeds to be found in a crimson-clover field are those which germinate in the fall and remain green during the winter, as does the clover. Most of these weeds bloom and mature their seed in the spring, some of them at the same time as the crimson

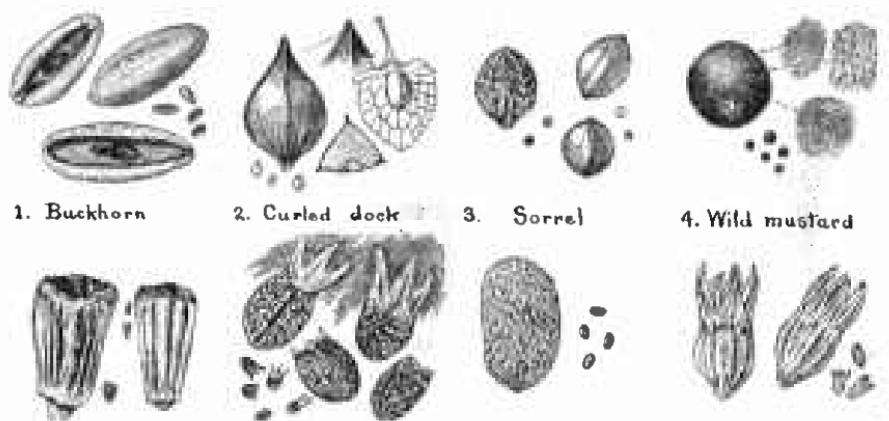


FIG. 13.—Seeds of weeds which often infest crimson-clover fields. These should be avoided when purchasing seed.

clover. Among these may be mentioned bitter cress, buckhorn, English charlock, field camomile, cut-leaved geranium, sorrel, dock, field madder, and moss weed. The seeds of some of these weeds are shown in figure 13. The weeds are ordinarily a serious pest only when the stand of crimson clover is for any reason scattering. When the field shows a thick stand of crimson clover, it is usually able to choke out any weeds in the fall, while its early growth in the spring enables it to crowd out most of those which survive the winter.

SUMMARY.

The handicaps under which crimson-clover seed production in this country has labored have necessitated the importation of from three to five million pounds of seed annually. The uncertainties of the foreign supply of seed make it highly important that the individual farmer arrange to save his own seed for reseeding purposes.

This is a thoroughly practical procedure on the ordinary farm by the use of the simple devices described within the pages of this bulletin.

The commercial production of crimson-clover seed in this country is especially handicapped by frequent untimely rains, which occur after the crop is cut and before the services of a huller can be obtained. A considerable acreage in a given locality is required to justify the presence of a huller in that vicinity. Where it is not desired to raise seed for commercial purposes, simple devices, some types of which can be made on the farm from readily available material at the expenditure of a few dollars, make it possible for anyone with a crimson-clover field to obtain seed for reseeding purposes.